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AFRL's XSS-10 team gains national recognition

by Jill Bohn, AFRL Public Affairs

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — The Air Force Research Laboratory/Boeing XSS-10 Team has been nationally honored by the American Institute of Aeronautics and Astronautics (AIAA).

The team has been awarded the Space Systems Technical Team Award for 2003, which is presented to recognize outstanding achievements in the architecture, analysis, design and implementation of space systems. The award will be presented in September 24 at the AIAA Space 2003 Convention, Long Beach, Calif.

AFRL's Space Vehicles Directorate, Kirtland Air Force Base, N.M., together with Air Force Space Command developed the 65-pound XSS-10. The first on-orbit experimental micro-satellite, with a program valued at $100 million, launched aboard a Boeing Delta II rocket Jan. 29, from Cape Canaveral Air Force Station, Fla. During its 20-hour mission, the XSS-10 successfully performed a series of on orbit maneuvers around the second stage of the Delta II. Other key contractor team members were Boeing Rocketdyne, Octant Technologies, Jackson and Tull, and Swales Aerospace.

CAPE CANAVERAL, Fla. — The Boeing Delta II rocket and Global Positioning lifts off Jan. 29 from Cape Canaveral Air Station, Fla., carrying the Air Force Research Laboratory's XSS-10 micro-satellite. Photo courtesy of Boeing.

"It is an honor for the XSS-10 team to be recognized with the prestigious AIAA award," said Thom Davis, XSS-10 program manager. "The success of the XSS-10 flight demonstration is the first step in applying micro-satellite technology to military space missions and paves the way for more ambitious experiments on XSS-11 and future programs."

The American Institute of Aeronautics and Astronautics, and its predecessors, have been the principal society of the aerospace engineer and scientist for more than 70 years. @

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http://extra.afrl.af.mil/news/index.htm

Speedy analyzer ensures safe use of jet fuels

by Sarah Hubbard, Propulsion Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — The Air Force Research Laboratory Fuels Branch has developed a new tool that analyzes jet fuel within five minutes and estimates important properties in a mobile laboratory setting.

The fast gas chromatograph, or GC, is an instrument that examines different types of fuels by separating the complex petroleum mixtures and determines whether or not they are safe for military use. According to Rich Striebich, chemical research engineer in the fuels branch and contractor at the University of Dayton Research Institute, the GC creates a very accurate "fingerprint" depiction of each fuel type.

The parts of the fast gas chromatograph include the oven, column, injector, flame-ionization detector, auto sampler and gas generators, which make the system portable. There are separate gas generators for hydrogen, air, and the main carrier gas, nitrogen. Water is also an important component in the process because electrolysis, the splitting of water into hydrogen and oxygen by electricity, is used to obtain the hydrogen gas used in the GC.

The GC process is both fast and simple, Striebich said. Samples of fuels are placed in a computer-controlled auto sampler which then grabs the bottle containing that fuel and places it under a syringe that extracts the fuel. The fuel in the syringe is then injected into a glass tube, the inside of which is slightly larger than a human hair. According to Striebich, the smaller the dimensions of the tube, the faster the analysis.

The fuel then separates inside the tube into its volatile and non-volatile components. A volatile substance is one prone to evaporation. The most volatile components come out of the process first and the least volatile ones last.

From this process, a gas chromatogram is formed. The chromatogram can then be related to various properties of fuel. To date, freezing point, flash point, sulfur content and distillation range have been used. Different features of the fingerprint chromatograms are important in predicting these four important properties.

"Our goal in this project was to create a GC that would run faster than a standard GC, which takes about 1-2 hours, and that can be field-deployable," Striebich said. "In Operation Iraqi Freedom, fuel is being obtained from European countries and often has to be tested for what type of fuel it is and what quality it is. There is no time to have it shipped to a regional lab to be specification-tested, so we realized the need for something field-deployable and fast to ultimately help the warfighter. The new GC can run and obtain specification estimates in only 5 minutes and should be out in the field soon."

The GC is also relatively inexpensive, at an estimated $35,000 per instrument, Striebich said.

"We had a great team of engineers consisting of government, contractor and top undergraduate students from UD working on the instrument, which was proposed and made operational in less than 1 year," Striebich said.

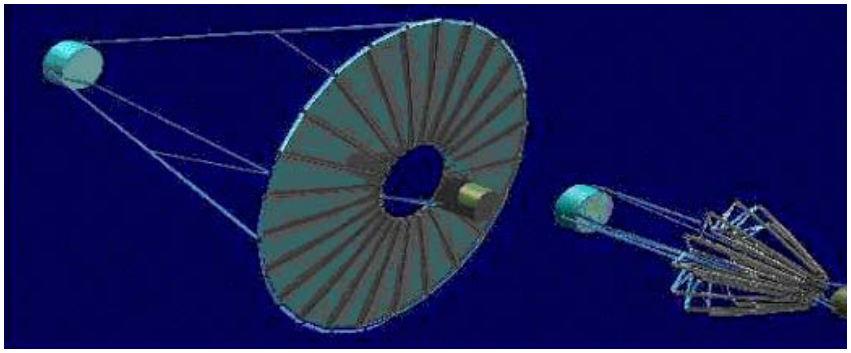
The Fast Gas Chromatography system is about to be deployed overseas and will help to keep aircraft and other systems operating safely and efficiently. @

AFRL scientists achieve mirror technology milestone

by J. Rich Garcia, Directed Energy Directorate

KIRTLAND AIR FORCE BASE, N.M. — A milestone in telescope mirror technology, completed recently by Air Force scientists, is leading to large, lightweight, space-based telescopes many times larger than NASA's Hubble Space Telescope.

Rather than use a heavy, glass mirror, researchers at the Air Force Research Laboratory's Directed Energy Directorate were able to produce a 1-meter-diameter (approximately 3 ¼ feet) mirror made of a thin-film membrane material. This optical-quality polyimide mirror was more than three times larger than the biggest membrane mirror previously possible.



An artist concept shows a thin-film membrane mirror, at right, in a folded configuration so it can fit aboard a rocket and then opened in space as shown at left. Researchers at the Air Force Research Laboratory's Directed Energy Directorate reached a milestone recently by producing a 1-meter-diameter (approximately 3 ¼ feet), optical-quality membrane mirror. Their goal is to produce a lightweight 10-meter membrane mirror, which could be used as part of a space-based telescope.

In this case, the membrane material was also of exceptional optical quality as judged by the uniformity of its thickness, which didn't vary by more than an average of 25 nanometers or approximately one-millionths of an inch.

Shifting from glass mirrors was necessary because of the limited cargo capacity of the space shuttle and other rocket boosters. But replacing glass with thin-film meant that a mirror could be transported to space in a folded or rolled configuration aboard a current rocket and then unrolled or expanded like an umbrella once in space.

According to 2nd Lt. Ethan D. Holt, the film mirror project officer in the directorate's Surveillance Technologies Branch, "Our goal is to produce a telescope mirror with a diameter of 10 meters or nearly. A surveillance telescope that size in orbit 124 miles over the earth would really improve our ability to image enemy and friendly assets and capabilities."

"The larger the mirror, the greater its ability to see, or resolve, objects on the ground," explained Dr. Richard A. Carreras, the branch's technical advisor. "For example, a 10-meter telescope in Los Angeles would be able to tell the difference between a basketball and a volleyball as far away as Washington D.C." Large space-based telescopes could also be used to focus the energy from lasers, another potential application for this technology.

Laboratory researchers were quick to point out that their accomplishment was made possible through the Small Business Innovation Research Program, through which they were able to work with SRS Technologies of Huntsville, Ala.

"SRS Technologies provided a unique processing capability," noted Dan K. Marker, membrane mirror principle investigator. "Our collaboration led to them producing this thin-film product that was subsequently named CP1-DE. The 'DE' suffix was added to recognize the Directed Energy Directorate's role in its development." According to Marker, numerous commercial contractors including Boeing Rocketdyne Technical Service (an in-house contractor) were involved in the project. @

Sensors scientist elected as SPIE secretary for 2004

by Erin Caylor, AFRL Public Affairs

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Dr. Paul F. McManamon, Air Force Research Laboratory's Sensors Directorate was elected as the 2004 secretary for the International Society for Optical Engineering (SPIE) in August.

McManamon is a senior scientist for infrared sensors, currently serving as a member of the scientific and technical cadre of senior executives. He served more than two and a half years as acting chief scientist for avionics and was the technical lead for more than 500 engineers.

The newly elected secretary has participated in three Air Force Scientific Advisory Board summer studies and is currently developing multi-discriminate electro-optical countermeasure systems.

McManamon received a bachelor's degree in physics from John Carroll University, and both his master's degree and doctorate from The Ohio State University.

Prior to the election, McManamon was named a SPIE Fellow. Fellows are members of distinction who have made significant scientific and technical contributions in the fields of optics, photonics and imaging.

He served on the SPIE Board of Directors from 1999-2002. As secretary, he will re-join the board and become a member of the Executive Committee. The board and its executive committee establish policy and strategy, assure that the society bylaws are followed, and approve the budgets for expenditure of society resources.

In his new capacity, he will approve the budgets and spending of society resources and make sure the society bylaws are followed in the manner of society business.

"I am really excited about being elected as secretary of SPIE. It is a great organization that continues to find ways to serve the technical community," McManamon said. "I enjoyed my first three years on the Board of SPIE and very much look forward to the challenge the next four years have in store for me."

The International Society for Optical Engineering was founded in 1955, to bring together engineers from several technical disciplines involved in high-speed, optically based test and measurement. @

AFRL welcomes colonel to materials deputy director post

by 2nd Lt. J. Elaine tt, AFRL Public Affairs

Col. Timothy Sakulich

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Col. Timothy Sakulich took over as the Air Force Research Laboratory's Materials and Manufacturing deputy director in July.

He comes to AFRL after an assignment with the Defense Cooperation Agency in Arlington, Va. where he served as the country program director for two years.

"The Air Force is great and will remain great because of what we (AFRL) are doing," Sakulich said.

The Michigan native is an Air Force Academy graduate and was commissioned in 1984. Sakulich holds a bachelor's degree in mathematics and a master's degree in applied mathematics from North Carolina State University.

Sakulich has served a variety of assignments including the Air Force Logistics Command, as an aide to the commander and as a logistic operations research analyst and branch chief. He also spent time in the Pentagon working for the joint staff and was a national defense fellow with the Institute for Defense Analyses in Virginia.

The colonel has two goals while at ML. First, he hopes to gain a deeper understanding of science and technology and how it transitions to the warfighter. Second, he wants to mentor the troops.

"I want our people to leave here motivated to stay in the Air Force and to use the tools they have learned here and apply them," he said.

Sakulich believes in a commitment to excellence. "Everything derives from it. If you are committed, then good things are going to happen personally, professionally and organizationally," he said. @

High-energy laser simulator transferred to Mesa branch

by Deb Mercurio, Directed Energy Directorate

KIRTLAND AIR FORCE BASE, N.M. — An F-16 high-energy laser weapon simulator, that will give pilots practice in using lasers to destroy targets, was transferred recently from Air Force researchers to the Fighter Weapons Training Branch in Mesa, Ariz.

Named the high-energy laser fighter, or HEL Fighter, it was developed by the Air Force Research Laboratory's Directed Energy Directorate and Air Combat Command's Theater Aerospace Command and Control Simulation Facility. The simulator is allowing pilots to become familiar with high-energy laser weapons, using those simulated weapons in tactical engagements against airborne and ground targets. Additionally, it will aid in the development of tactics, techniques and procedures for new fighter laser systems.

"The ultimate goal is to have pilots use simulators to participate in war games and determine the utility of using high-energy laser weapons against an enemy that is using conventional weapons," said Rudy Martinez, the directorate's HEL Fighter project manager.

Aiding the directorate and the simulation facility in the model's development were several Air Force and industry organizations. Lockheed Martin (local simulation facility personnel and corporate employees in Ft. Worth, Texas) integrated the F-16's fire control system and software coding. Employees from Lockheed Martin and Southwest Research Corp. integrated battlespace (the simulated environment in which the fighter would fly) into the HEL Fighter model. The directorate's Laser Effects Research Branch determined lethality values.

The New Mexico Air National Guard's 150th Fighter Wing, known as the "Tacos," participated in the simulator development by providing pilot-operator feedback. F-16 pilots were involved in the project since its inception.

According to Martinez, comments and suggestions from the 150th Fighter Wing's pilots were invaluable on a variety of issues facing this new weapon system and were included in the model development. Now, personnel in the Fighter Weapons Training Branch will provide further feedback, and the data received on F-16 laser weapon engagements will assist in determining the ability of lasers on fighter aircraft.

"The simulator is fairly accurate in representing real-world laser weapons and very accurate in target engagements," Martinez said. "Transmission losses and propagation through the atmosphere are calculated for each engagement. Target lethality is based on look-up tables at the present, and the lethality values are estimated where real values are unknown."

Martinez said that the look-up tables are lethality values for targets in a spreadsheet format, which the model can use during engagements of targets. The goal is to develop a model that calculates the values in real-time during an engagement, thus doing away with the lookup tables.

According to Martinez, the directorate's Lethality Branch is investigating the feasibility of developing a common laser target damage model that can be integrated into laser-weapon simulators. The directorate and Lockheed Martin are currently investigating the future use of laser weapons on the Joint Strike Fighter, and the HEL Fighter is a major step in that effort.

Additional weapon systems for an advanced systems war game are being planned for next September. According to Martinez, the AFRL's Space Vehicles Directorate will provide war-gaming simulator systems, and Boeing has expressed an interest in participating with their unmanned combat aerial vehicle simulator.

Martinez said that by adding more F-16 laser weapon system platforms at the Fighter Weapons Training Branch, more participation by HEL Fighters in engagement war games will be possible. The directorate and the simulation facility are in the planning stages for hosting an advanced systems war game.

"The plan is to use operational personnel to integrate and engage advanced system simulators into a theatre conflict war game," Martinez said. "How well these advanced systems perform during this war game will help engineers refine their designs and eliminate system deficiencies – a sort of simulator-based type of acquisition process, if you will." @

AFRL recognizes corporate award winners at luncheon

by Erin Caylor, AFRL Public Affairs

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Air Force Research Laboratory recognized its top performers at the fourth annual AFRL corporate awards luncheon July 31, at the Nutter Center, Fairborn.

This year's winners were selected from 123 candidates for 11 award categories within the AFRL directorates. Finalists and winners were chosen by the AFRL corporate award selection board and approved by Maj. Gen. Paul Nielsen, AFRL commander.

Both team and individual awards were presented during the ceremony.

• Barbara Lupo, Munitions Directorate, Eglin Air Force Base, Fla., earned the award for administrative excellence for her expertise in records management. Lupo was chosen to serve as an inspector of the directorate's in-house files and found and corrected more than 300 discrepancies in a one-month period.

• Donna Lindner, Materials and Manufacturing Directorate at Wright-Patterson Air Force Base, garnered the senior administrative excellence award for her accomplishments as the office security manager. Lindner regularly reviewed the branch, section, division, and contractor offices and currently holds the International Merchant Purchase Authorization credit card for five separate accounts totaling more than $200,000.

• The mission support team award was presented to the 15 members of the munitions contracting division team, Munitions Directorate, for their completion of six critical source selections for fuzing, penetrating, and seeker advancement.

• Ernest Meyer, Materials and Manufacturing Directorate at Tyndall Air Force Base, Fla., earned the individual mission support award for his contribution as the overseer for the job order cost accounting system for more than 65 government employees and was recruited to train other base organizations in the Automated Business Service System.

• Maj. Timothy Klopfer, Air Vehicles Directorate, was credited with the leadership award for his outstanding guidance to the 11-person contracting division. He developed a database to automatically track actions and red-flag late milestones.

• Parker Buckley, Propulsion Directorate, Wright-Patterson Air Force Base, took the senior leadership award for his key role in the development of the hypersonic pillar of the National Aerospace Initiative. Buckley also led the development of the first free jet demonstration of the hydrocarbon-fueled scramjet engine.

• The signature exploitation team, Space Vehicles Directorate at Kirtland Air Force Base, N.M., earned the scientific/technical achievement team award for the first performance of the airborne measurements, and the proposed and patented hypertemperol imaging as a detection technique.

• Alan Lindsey, Information Directorate at Rome Air Force Base, N.Y., earned the scientific/technical achievement individual award for significant advances in time-frequency waveform design framework and digital implementation techniques.

• Capt. Jess Drab, Munitions Directorate, was presented the scientific and technical management award for his personal involvement in the technology demonstration of the massive ordinance air blast. Drab led the conceptual design, engineering analysis and development, fabrication of test items, and plans for the airdrop testing of the weapon prototypes.

• The commander's cup team award went to the laser eye protection team, Human Effectiveness Directorate at Brooks Air Force Base, Texas, and the XSS-10 team, Space Vehicles at Kirtland Air Force Base.

• Mark Gruber, Propulsion Directorate, and Jeff Hughes, Sensors Directorate, both at Wright-Patterson Air Force Base, took the commander's cup individual award. Gruber, an aerospace engineer, is recognized for his leadership skills while directing the upgrade to AFRL's scramjet combustion test cell, Cell 22. Stone, a technical adviser, is credited for developing first capability to protect high-value Department of Defense scientific and engineering software applications from foreign exploitation.

"It was not an easy task to select a winner in each category," Nielsen said. "The competition was tough, and you should all be very proud of your achievements and contributions to AFRL. The nominees are an impressive group of individuals and only go to show the caliber of people we have in AFRL. I am honored to lead such an impressive and talented team as we redefine air power for the 21st century." @

AFRL lends support to Columbia accident investigation

by Grace Janiszewski, Sensors Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Air Force Research Laboratory scientists here helped uncover mysteries surrounding the Space Shuttle Columbia and crew loss earlier this year by trying to determine the flight day two object origin.

Although not able to determine exactly what the object was because it burnt up on re-entry, AFRL experts helped NASA officials sift through materials to eliminate a field of possible candidates.

Investigators reviewing automated space debris tracking radars shortly after the tragedy discovered that a mysterious object separated from the Columbia on its second day in space, "flight day two." This piece became known as the "flight day two object."

NASA experts said during previous shuttle flights, materials have occasionally drifted out of the payload bay, or individual tiles have come off on orbit. However, since a serious accident had obviously occurred, Columbia Accident Investigation Board members wanted to know what the "flight day two object" may have been, and whether it had any relationship to the tragic events that followed.

Dr. Brian Kent and Dan Turner, working with a team of engineers and technicians from AFRL's Sensors Directorate, Radar Cross Section facility became part of an inter-governmental team charged with narrowing down the object's identity. They worked with engineers from the Johnson and Kennedy Space Centers, U.S. Strategic Command and Peterson Air Force Base, Colo.

Since the object in orbit eventually decayed and burned up 60 hours after it was first observed, sensors team members said they knew two solid characteristics about the flight day two object: Its radar signature at several frequencies and its ballistic coefficient, or the area to mass ratio of the part. By using these two pieces of information, they said they could conduct tests and analyze external shuttle materials to help screen out candidates.

According to Kent, the first tests involved ordinary shuttle tiles, thermal blankets and thermal insulation materials. Radar signature tests performed on AFRL's advanced compact range here initially screened out many of the first candidates NASA officials brought forward. @

Net Index

Due to the number of submissions we receive, some sections of *news@afrl* are available exclusively on-line. The on-line version of the newsletter allows users to view the AFRL corporate calendar, news releases generated by AFRL headquarters, operating instructions, L@b L@urels and Roundups sections.

The L@b L@urels section of the electronic newsletter is dedicated to members of Air Force Research Laboratory who receive awards and honors. The Roundups section of the electronic newsletter keeps Air Force Research laboratory employees informed about contracts AFRL has awarded. Below is an index of articles one can find in each of these on-line sections.

L@b L@urels

- **AFRL recognizes corporate award winners**

Roundups

- **AFRL Rome awards SBIR contract to DeWitt firm**
- **IF represents Air Force at Venture Capital Conference**
- **Digital watermarking research awarded to Kodak**

To view the full text of these and other articles visit the *news@afrl* page on the Internet at http://extra.afrl.af.mil/news/index.htm.
To submit L@b L@urels or Roundups from your directorate, send a query to AFRL Public Affairs at:

Jill.Bohn@afrl.af.mil

For more on these stories see news@afrl
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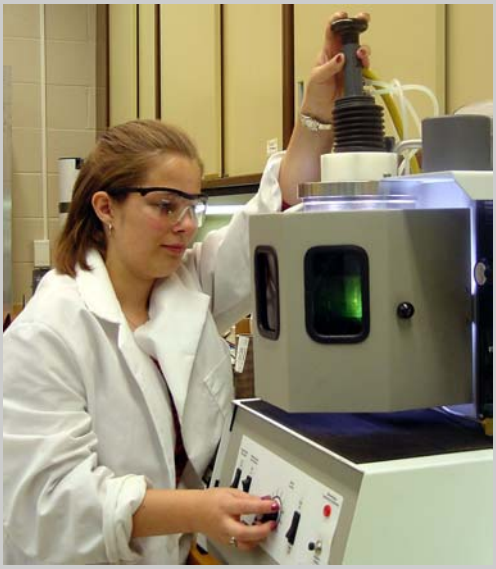
Hands-on environment



WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Pam Walters, Air Force Research Laboratory student intern, studies state-of-the-art amorphous metal alloys in the Mini Arc Melter, also known as "Sparky." The Metallic Composites research group in the Materials and Manufacturing Directorate develops high strength materials for use in a variety of Air Force systems. Walters is one of approximately 130 high school and college students working in AFRL at Wright-Patterson Air Force Base this summer. The 17 year-old lives in the Dayton area and attends Carroll High School. She was recruited through the Central State University Science Fair. To learn more about AFRL visit http://www.afrl.af.mil (Photo by 2nd Lt. J. Elaine Hunnicutt)